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THE RELATION OF EYE-STRAIN TO HEADACHE.

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Headache due to eye-strain is very common. There are few persons who have not felt it. With many it is merely incidental, and so far out of their ordinary experience as to be of no importance. But with very many it is a cause of sufficient suffering and impairment of working power to demand serious attention. The constant tendency of business and amusement is to tax the eyes more heavily. Rough mechanical labor is more and more accomplished by machinery; while that requiring accurate and constant adjustment is multiplied, to occupy the human brain working with eye and hand; and leisure means, more and more generally, the exception of sight from the general rest of faculties taxed by labor. To one who knows this and reflects upon it, it can be no matter of wonder that the balance between the capacity for seeing and the supposed need for seeing is so often lost.

To pursue the subject from simple fact toward abstract generalization, I shall introduce a few cases; of interest, not because they are so rare, but because they are so common.

CASE 1.—W. S. D., æt. twenty-five; lawyer, of fine physique. As a boy was subject to almost constant headache, and violent attacks of hemicrania occurring as often as once a week, which compelled the cessation of all exertion, mental and bodily, sleep giving relief. When in school, the attacks were apt to occur toward the close of the week, then came a day or two of comparative immunity, then, with school-work, increasing headache, culminating in another attack.

The attack commenced with pain in the left frontal or occipital region, whence it spread over the whole left side of the head. In January, 1882, he was found to have compound hypermetropic astigmatism, the correcting lenses being

R. + 2.5 s. $\odot$ + 0.5 cy. axis 90°.

L. + 5.25 s. $\odot$ + 0.5 cy. axis 75°.

He was ordered lenses correcting the astigmatism and most of the hypermetropia, and wore them, with entire freedom from head-



ache, until January of the present year, when the glasses were broken, and he neglected to have them repaired. He was now in excellent general health, and for a time suffered but little inconvenience from eye-work without glasses. But by and by there was some irritation of the eyes, particularly the left, after using them; then a little headache, and, finally, in March, a well-marked attack of the old enemy, "sick-headache." He then reported to me, resumed the use of glasses, and the headache disappeared.

This case is one of a considerable class, where, in persons of good muscular development and general health, supplied with abundant nourishment and working under favorable conditions, an error of refraction entails eye-strain sufficient to alone set up serious headache. But the next case belongs to a still larger class.

CASE 2.—Mrs. C. T., æt. thirty-three; rather thin, and decidedly anæmic; did not sleep well, with poor appetite, endometritis and leucorrhœa; consulted me in April, 1883, on account of headache. This was rarely entirely absent, but there were attacks in which the pain, commencing in the frontal region, spread over the entire head, became terribly severe, causing complete prostration, and compelled rest in bed for one, two or three days. These attacks had for some months occurred as often as once a week. Menstruation was always attended with one, and this had been the case for years. There was also a fixed pain in the occiput and back of the neck, and some pain in the lower part of the back. She had been under the care of an intelligent and very careful physician, who had faithfully advised the usual remedies for such disorders. He reported that local treatment of the cervix uteri, with fuming nitric acid, a period of complete rest away from home, a course of iron, and a prescription containing phosphorus and strychnia, had each seemed to cause some improvement in her condition; but the improvement was not great enough or lasting enough to warrant the continuance of the remedy, or to be at all satisfactory to either patient or physician, and the latter had advised a trial of glasses as about the only thing necessary to complete the circle of therapeutic experiment.

Her history was that the headaches came on after any exertion, not especially after eye-work, but that there was the clear connection with the menstrual epoch. The ophthalmoscope revealed a low degree of hypermetropia. Her eyes were placed under the influence of duboisia, giving rest to the mechanism of accommoda-

tion. In ten days she returned to say that within a few hours after commencing the use of duboisia headache had disappeared, and from that time she had been entirely free from it. She was now given her full correction,

R. + 1.25 s. $\ominus$ + 0.5 cy. axis 145° ,
L. + 1.25 spherical,

to wear constantly, and directed to continue the use of the duboisia for a month. During this time menstruation occurred, but she remained free from headache, and the pain in the occiput and back of the neck entirely disappeared.

After ceasing the use of duboisia, she again had occasional headache, but nothing like her old attacks; although there usually is still some headache at the menstrual period. She continues thus using her correcting lenses and living in comparative comfort. But when I saw her again in April of this year, she alluded to the time, when her eyes were under the influence of the mydriatic, as the longest period of complete immunity from headache that she ever had. It should be mentioned, that during that time she was at home, leading her ordinary life, except as eye-work was suspended, and no other remedial measures were resorted to.

Note, especially, with reference to this case, the absolute freedom from headache coincident with the complete suspension of accommodative effort; the return of slight liability to headache with the return to accommodative effort under more favorable conditions; and that the occurrence of severe attacks seemed entirely independent of any use of the eyes.

In both the foregoing cases excessive accommodative effort was necessitated by the presence of hypermetropic astigmatism, but headache may arise in the same way where eye is perfectly emmetropic.

CASE 3.—W. G., a young man of nineteen, of good general health, but a hard student; during the winter of 1884 had increasing headache and failure of accommodative power and endurance. By the beginning of February these had almost rendered study impossible. Under homatropin the refraction of both eyes was proven practically emmetropic (less than 0.25D hypermetropic astigmatism in either). I gave him minute instructions as to how to use his eyes for study with the least possible demand upon accommodative power, and ordered, for near work, for each eye + 1.D spherical with a 2° prism base toward the nose; that the accommo-

dation might be assisted without interfering with the relation between accommodation and convergence. The use of the homatropin necessitated two days' suspension of school-work. After that he went right on, doing the work under which he had just broken down. Improvement commenced at once and progressed steadily until, a month later, he was entirely free from headache or asthenopic symptoms. He continued his work without other inconvenience up to the end of the school-year, and then, with lessened demand on the power of accommodation, was able to throw aside the glasses altogether.

But eye-work may cause headache by strain other than that upon the power of accommodation. As a symptom of insufficiency of the internal recti in myopia it is quite generally appreciated, but it is not always remembered that the same insufficiency may arise from excessive near work in those whose refraction is emmetropic or hypermetropic.

CASE 4.—D. L. C., æt. twenty-three, student, came to me in February last for frontal and occipital headache, increasing greatly with any near work, and rendering its continuance impossible after from ten minutes to half an hour. Refraction emmetropic in both eyes. For both near and distant vision there was an insufficiency of the internal recti muscles, leading to an outward deviation of the eyes of about 8° , when vertical diplopia was produced. He was given a prism of 2° base to the median line for constant use. A month later he reported himself entirely free from headaches, and has continued so except once, when he tried to go without his glasses.

I will not pass this case, however, without remarking that I do not expect the relief to be permanent. The power of all his ocular muscles is markedly deficient, and although the prisms have secured a temporary balance between capacity for effort and effort required, this balance is very liable to be destroyed. The relief of muscular insufficiency by prisms is very different from the correction of ametropia by lenses.

Dr. Henry D. Noyes has called attention to insufficiency of the external recti muscles. Of this condition headache has been a very prominent symptom in the few cases I have recognized. For some years I have also, as a matter of routine, tested the balance of the superior and inferior recti muscles, or, more properly, the balance of all muscles tending to turn the eye up and down. The following case of deficiency in this respect is of interest here.

CASE 5.—M. C. McF., æt. fifty-three, farmer, has been subject to headaches "all his life." These were most severe just back of the bridge of the nose and in the occiput. Were worse after using the eyes for near or distant vision, as after reading, or being on the road or in town. About once a week he had a specially severe attack, which would frequently confine him to bed for the whole day. He has tried many things for the relief of these headaches, but without benefit. He was emmetropic with a near point of sixteen inches, and full vision for each eye. There was a very slight insufficiency of the internal recti for objects within twelve inches of the eye. To cause vertical diplopia it required a prism of 2° to 3° , base up, before the right eye, and one of at least 4° before the left eye.

This tendency to vertical deviation was constant, whether he looked up or down, to the right or left, at near or distant objects. He always overcame it, so that diplopia did not occur; but the effort to overcome it seemed to be the only chance for eye-strain, and the history pointed clearly to the increase of headache by the use of the eyes. I therefore ordered for distant vision

Right, plane glass;
Left, prism 1° base up;

and for near work the proper spherical lenses, so decentred as to give the same prismatic effect. These were ordered last June. Two months later he told me he had not had a headache since he got the glasses; and a month after that his wife (bringing a daughter as a patient) said her husband never had such freedom from headache in the thirty years she had known him.

The cases now introduced will serve to illustrate the facts with reference to these headaches; that they do not depend upon a certain defect in refraction, nor upon the strain of any particular muscle, but that they arise from requiring of the muscles accessory to vision, or of the nerve centres and tracts connected with them, more than these portions of the muscular or nervous system are capable of doing. Subjection to such a requirement is the essence of eye-strain.

Of the clinical characters of these headaches, I need only say that they are identical with those of all other classes of headaches, and, therefore, do not aid in the diagnosis of the cause. Such diagnosis may rest sometimes on the sequence of strain and each,

but at others is only to be determined by the therapeutic test, the removal of all possible strain.

In the whole domain of medicine there is no subject that has been more completely given over to unprofitable theorizing than the pathology of headache. "Cerebral anæmia," "cerebral hyperæmia," "vasomotor spasm," "vasomotor palsy," "blood poisoning," "reflex irritation" and "nerve storm" have struggled for possession of the field. And in the mind of the practitioner success generally rested with the first theory propounded, or the one set forth in the most specious and best-rounded sentences. Still, scientific advance is mostly made along the lines of some working hypothesis; and I wish briefly to outline the one I hold with reference to these headaches of eye-strain, believing it will prove helpful to a better understanding of them and fruitful in practical results.

Pain I take as a consciousness of impaired nutrition in some portion of the nervous system. It is not a special sense; it is not an exaltation, or, in any ordinary sense, an alteration of smell, sight-hearing, taste or touch. It may coexist with these, but is no part of them. The force and significance of this view will appear to one who reads with careful consideration the works of Anstie, particularly his "Stimulants and Narcotics," and "Neuralgia and Its Counterfeits."

A second point cannot be better stated than in these words of Hilton ("Rest and Pain"). "If a patient complains of pain on the surface of the body, it must be expressed by the nerve which resides there; there is no other structure that can express it. Somewhere in the course of its distribution between its peripheral termination and its central origin, the precise cause of the pain expressed on the surface must be situated."

Now, headache is pain referred to the distribution of the fifth cranial and second cervical nerves. Eye-strain is excessive exertion of the ocular muscles and the efferent nerve paths that lead to them. Is it any forced or unwarrantable supposition that, if the use of one nerve path disorders the nutrition of another, such disorder must occur where such paths are closely contiguous or actually run together? Now, the fifth nerve is distributed to the portions supplied by the motor-nerves of the ocular muscles. But the great occipital nerve has no such connection. There is another fact opposed to the supposition that the harm done the fifth nerve is done at its peripheral terminations, viz., that when headache

occurs you are not specially apt to have any local lesion of the eye or its appendages. Given a certain amount of eye-strain, and you may have headache or you may have local irritation or inflammation; occasionally they coexist, but usually they do not. The occurrence of one, probably by checking the strain, tends to prevent the occurrence of the other. The next point at which these motor and sensory tracts come in contact is in the medulla. The fifth, by its extensive connections with the gray matter of the medulla, comes closely in contact with the nuclei of all the cranial motor-nerves. At the same point the second cervical comes in relation with them. Here may be located the essential morbid condition of eye-headaches. Nor would headaches arising from other sources demand the different location of their essential lesion. Such essential morbid condition is a vice of nutrition, unrelated to any known appearances, either gross or microscopic, but related to certain facts of physiology and pathology. The nutrition of this portion of the nervous system, of course, depends on both local and general influences; among the former, its vascular supply and the demands on it in the way of functional performance; of the latter, the condition of the blood throughout the body, and the nervous influences bearing on it from all parts of the nervous system.

Its nutrition would be improved by functional rest, or a better vascular tone, or by any influence enriching the blood or removing irritation or strain from distant organs. An eye-headache is not only aggravated by eye-work; it is aggravated, or even set up, by the return of the menstrual epoch, by hunger, by anæmia, by exhaustion of body or mind, or by the lowered general character of nutrition after exhausting illness. And, conversely, it is not benefited merely by lenses and prisms, atropia or the dark room; but by sleep, food, tonics, wholesome living—all influences that improve the nutritive processes throughout the body. But the converse is also true, and I think, on the present occasion, needs to be most insisted on. That because you find a headache is benefited by a hearty meal, or a restricted diet, or a brisk purge, or a rest from business, or a course of iron and strychnia, or the wearing of a pessary, you are not warranted in supposing that eye-strain has nothing to do with that headache. If one of the measures above mentioned bring about complete recovery, well and good; nice points of pathology may well be waived. But if, of these remedies, some, or all, presently lose their control, and the headache returns to be a plague and in-

cubus, justice will not have been done the patient until the possibility of eye-strain is excluded. Eye-strain, like many other disorders, is of double parentage—remove one parent and propagation ceases. If you cannot bring nutrition up to where the nerve-tracts will readily do all that has been required of them, it may be possible to reduce the effort required to within the capacity of these nerve-tracts. It is, however, entirely conceivable that a morbid condition may become so thoroughly engrafted upon the system that the simple removal of its original cause is followed, but distantly, or not at all, by recovery. This is sometimes the case with the headaches under consideration, especially well-marked migraine, which is certainly often, and perhaps always, due in part to eye-strain.

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